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AUTHOR Downes, Meta M.; And Others
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ABSTRACT

Ten hearing impaired college students and 10 normal hearing students were given receptive speech discrimination tests in English, French, and Spanish. No significant differences between English and foreign language discrimination scores were found for the normal hearing Ss. The hearing impaired Ss had significantly lower discrimination scores for foreign language than English. Findings suggested that foreign language instruction should be modified to de-emphasize hearing and speaking components. It was also concluded that the difference in performance in foreign languages by hearing impaired students is not purely auditory, but stems from lack of higher level cognitive and semantic aspects. (Author/CL)

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A Comparison of the Receptive Discrimination Skills of Hearing Impaired and Normal Hearing College Students for English and Foreign Languages

Meta M. Downes, M.A.; M.A.Ed.; M.S.
Assistant Professor
East Carolina University
Greenville, NC 27834

W. Garrett Hume, Ed.D.
Professor
East Carolina University
Greenville, NC 27834

Kevin F. O'Brien, Ph.D.
Assistant Professor
East Carolina University
Greenville, NC 27834

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Abstract

English receptive discrimination tests were found to be an inappropriate measure to determine a hearing impaired student's potential ability to learn a foreign language. Hearing impaired college students and normal hearing students were given receptive speech discrimination tests in English, French, and Spanish. No significant differences between English and foreign language discrimination scores were found for the normal hearing subjects. The hearing impaired subjects had significantly lower discrimination scores for foreign languages than English. Implications are that foreign language instruction should be modified for the hearing impaired, and that the difference in performance in foreign languages by hearing impaired students is not purely auditory, but stems from lack of higher level cognitive and semantic aspects.

Hearing impairment may have an effect upon the learning of a foreign language through an oral-aural approach. Various liberal arts curricula in many colleges and universities have a foreign language requirement, and these institutions have generally pursued two approaches to this requirement with regard to hearing impaired students: 1) the students take a foreign language with a supplemental approach which de-emphasizes the oral aspects of the language; or 2) American Sign Language is substituted for the foreign language requirement. There is a dilemma in the selection of a diagnostic measure which can be used to make a fair decision with regard to a hearing impaired student's ability to learn a foreign language. English receptive discrimination tests are used to evaluate the ability to handle the phonemic acoustic variables required for receptive auditory discrimination. Such testing may not be an adequate measure to predict success or failure in a foreign language because of the differences in linguistic constraints and cognitive aspects of foreign languages versus the English language.

Most references to language instruction for the hearing impaired are based upon problems encountered by deaf students and the profoundly hearing impaired because their native language base may not be conventional English (Luetke-Stahlman, 1983), and they have not fully developed the internal language system of auditory English (Crandall, 1978).

In reference to foreign language instruction, hearing impaired students have difficulty with the oral-aural language approach and with mastering the components of hearing, speaking, reading, and writing. Modern foreign languages are taught with an emphasis on speaking, and

this is difficult for hearing impaired students to comprehend on the amplifying equipment in the language laboratory since they rely heavily on hearing through speech-reading (Kindred, 1976). In German university preparatory schools for the hearing impaired, the curriculum is the same as in hearing schools, but the teaching of English is modified to provide visual structuring prior to reliance on texts and other techniques. Students are not judged on explicit speaking performance in English, but rather are encouraged and reinforced to attempt discussion in English regardless of errors made (Hartmann, 1979). At Gallaudet College, the focus of foreign language instruction is on reading and writing rather than on hearing and speaking, and students fulfilling foreign language requirements are not expected to be able to speak the language (Ingold, 1980).

The hearing impaired may also encounter difficulty with foreign languages because of the different suprasegmentals and their own linguistic experience. A study by Gandour et al. (1980) investigated the perception of the Thai language tones by hearing impaired subjects, and results indicated confusion in identification of tones with hearing impairment and resultant errors in word identification since the tonal differences change meanings of words.

Gat and Keith (1978) investigated auditory speech discrimination by normal hearing native and non-native speakers of American English. Their non-native subjects were grouped according to number of years of experience in the United States. One group had one year and the other 3 to 4 years in the U.S. When discrimination was tested with increasing signal-to-noise

ratios, the non-native subjects experienced a sharp decrease in discrimination scores as compared to native speakers. It was concluded that linguistic experience had a significant effect on speech discrimination abilities.

A related study by Danhauer, Crawford, and Edgerton (1984) involved the use of a Nonsense Syllable Test (NST; Edgerton and Danhauer, 1979) to assess speech discrimination skills. Their normal hearing subjects included a group of monolingual English speakers, a group of predominantly Spanish speakers, and a group of bilingual English and Spanish speakers. Results indicated that the bilingual and English speaking groups performed almost equally well, but that the Spanish speakers had significantly greater difficulty on this English speech sound discrimination task using nonsense syllables. It was concluded that Spanish speakers would have difficulty with any testing comprised of English stimuli and that the factor of phonologic background would be significant.

It was the purpose of this study to investigate one particular facet of difficulty encountered by hearing impaired students, that of the acoustic discrimination of a foreign language. It is recognized that other variables, such as cognitive and linguistic aspects of languages, may also affect receptive discrimination of speech stimuli. However, there is no evidence that a comparison of the speech discrimination abilities of hearing impaired students and normal hearing students, in English and foreign languages, has yet been accomplished.

Subjects

The participants in this study consisted of 10 hearing impaired

college students aged 19 to 27 years ($\bar{x}$ = 21.6 years) and 10 normal hearing students aged 20 to 26 years ($\bar{x}$ = 22.9 years). The normal hearing subjects obtained pure tone air conduction thresholds of 15dB HL or less in both ears for the frequencies 125-8000Hz and sound field speech reception thresholds of 10dB or less. The hearing impaired subjects had oral language as their primary mode of communication and had moderate to severe bilateral sensory-neural hearing losses. Pure tone averages for the frequencies 500, 1000, and 2000 Hz ranged from 48 to 81dB HL for the right ear ($\bar{x}$ = 59.7dB HL) and from 13 to 95dB HL for the left ear ($\bar{x}$ = 56.5dB HL). Aided sound field speech reception thresholds ranged from 20 to 45dB HL ($\bar{x}$ = 30dB HL). Three additional hearing impaired students who were tested were eliminated because their hearing losses were too profound to obtain adequate receptive auditory discrimination in English.

Both groups included students who had studied a foreign language in high school and/or in college, and students who had no foreign language background. Of the normal hearing subjects, all had studied a foreign language in high school (7 French, 2 Spanish, 1 Latin and French); three of these had studied French in college as well. Within the hearing impaired group, 4 had studied a foreign language in high school (2 French, 1 Spanish, 1 Italian) and 3 had studied a language in college (2 Spanish, 1 Latin). Five subjects had no foreign language experience.

Materials

Speech discrimination materials consisted of 50-word lists in English, French, and Spanish. The English list was taken from the C.I.D. W-22 (PB word list), the French list from Listes Phonétiquement

Equilibrées (Fournier in Portmann and Portmann, 1961), and the Spanish list from Lista de Palabras Balanceadas (Tato in Sebastian, 1963). Recordings of the lists were made on a Sony 2-channel reel-to-reel tape recorder Model TC-270. The signal attenuation was controlled through a Grason-Stadler 1701 dual channel speech audiometer. Audiometric testing was conducted in a two-room audiological suite meeting ANSI standards (ANSI, 1971). Pure tone air conduction stimuli were presented through an audiometer (Grason-Stadler, 1701) to earphones (Telephonics TDH-49) mounted in supra-aural cushions (MX-41/AR). Speech discrimination lists were delivered in sound field in an IAC sound room (model 10-1184).

Procedure

Each subject was given a pure tone air conduction threshold test under phones, and speech reception thresholds were obtained in sound field. Aided speech reception thresholds were obtained for the hearing impaired subjects. Two of these subjects did not use hearing aids.

The speech discrimination lists were delivered in sound field at 35dB SL. For the English discrimination task, the subjects were asked to write the words. The French and Spanish discrimination lists were randomly presented and the subjects were required to repeat the words they heard. Their responses were recorded via a Realistic Tie Clip Mike (20-12,000 Hz, 360° pickup) onto a Marantz Superscope (C-200 LP) cassette tape recorder.

Results

The subjects' responses to the French and Spanish discrimination lists were evaluated as correct or incorrect by two professors who have taught both French and Spanish. The judges heard the taped presentation

and the recordings of the subjects' responses, and had printed copies of the French and Spanish discrimination lists for reference. A criterion of 10% was used to ensure interjudge agreement. All scores for both the normal hearing group and the hearing impaired subjects met this criterion.

A summary of individual data for the normal hearing subjects is contained in Table 1, and a summary of individual data for all hearing impaired subjects is provided in Table 2. The data displaying the mean discrimination scores for the normal hearing and hearing impaired subjects and judge reliability are contained in figure 1. Means and standard deviations for the discrimination scores by hearing ability group are given in Table 3.

A preliminary analysis using a split-plot analysis of variance (ANOVA), which allows for the repeated measures, was performed (Kirk, 1982). This analysis indicated significant group differences ($F = 46.8$ with $df = 1, 18$ and $p < .0001$), and significant interaction between the discrimination score profiles and hearing ability group ($F = 9.21$, $df = 4, 72$ and $p < .0001$). Examination of the covariance structure of the discrimination score profiles by group indicated that assumptions for the split-plot ANOVA might not hold for the data. Considering the split-plot results, and possible assumptions violations led to an analysis based upon the randomized complete block ANOVA within each hearing ability group, and contrasts among the discrimination scores based upon the methods of Scheffe or Dunn (Kirk, 1982).

The block ANOVA indicated significant differences among discrimination scores for the normal hearing group ($F = 9.31$, $df = 4, 36$ and $p < .0001$). The critical value required for the Scheffe method was

F = 3.89 with error df = 36 and α = .01. This analysis led to significant differences between judges (F = 5.82), foreign languages vs. English (F = 28.14), with French vs. English (F = 31.15), and Spanish vs. English (F = 16.84). No significant differences were found between the Spanish and French discrimination scores (F = 3.27). An examination of the compound sphericity assumption required for the analysis indicated the assumption was met. Table 3 shows that discrimination scores for the normal group had a range of values (91.2 to 99.2) with relatively small amounts of variation, hence differences among these scores might not be viewed as substantively meaningful. The scores are percentages correct for a 50-item discrimination list. A difference of between 99.2 and 91.2, as seen for the normal hearing group, is only a difference of 4 items on the list.

Scores for the hearing impaired group are also in Table 3 and ranged from a high for English of 79.6 with the range of foreign language scores of 44.6 to 57.4. The compound symmetry assumption for these scores, necessary for the block ANOVA, was questionable. However, even using the conservative F-ratio of Box (Kirk, 1982), significant differences among the discrimination scores were indicated (F = 16.17 with df = 1, 9 and $p < .01$). Since the compound symmetry assumption was questionable, contrasts among means were based upon Dunn's method, and individual error terms. The required critical value based upon 9 df was t = 4.17 for α = .01 and 5 contrasts. Results for this analyais indicated significant differences between foreign languages and English (t = 7.59), with English vs. French (t = 7.70) and English vs. Spanish (t = 6.16). No significant differences were found between judges or between French and Spanish scores.

Discussion

The results indicate that the hearing impaired students did not perform as well as normal hearing students in receptive speech discrimination of English, French, or Spanish. However, the most important finding is that the hearing impaired students' performance on the foreign language discrimination tasks was significantly poorer than their English discrimination scores. It is obvious that these results demonstrate more than phonetic discrimination skills or the lack of them. The English discrimination of the hearing impaired is superior to that of foreign languages because they are able to use their linguistic knowledge of English, their native language, to synthesize and supplement the acoustic information of a speech discrimination test. Thus, the use of such testing to predict the ability to discriminate and perform orally and aurally in another language is inappropriate. Hearing impaired students cannot be expected to perform as well as normal hearing students in foreign languages taught by an oral-aural method because they do not have access to other variables needed to supplement the acoustic input. The hearing impaired cannot adequately make use of the avenue of speech reading which they have relied upon heavily for so long. Since only approximately one third of the information is obtainable through speech-reading under optimal conditions in English (Jeffers and Barley, 1978), obviously much less will be understood in a foreign language. As a result, the hearing impaired have much difficulty with the auditory and visual components of a foreign language in which they lack experience. In this respect, the results are similar to the findings of Gat and Keith (1978) in which linguistic experience had an effect upon receptive auditory discrimination abilities. As Danhauer et al. (1984) indicated,

foreign speakers have difficulty discriminating English stimuli, and it follows that hearing impaired English speakers will have problems discriminating in languages for which they have no familiarity with the necessary phonologic background.

Summary

Two implications are inferred from the results of this study. First, it is suggested that modifications should be implemented in foreign language instruction for the hearing impaired. Since these individuals lack linguistic experience, speech reading abilities, and synthesis of acoustic information in foreign languages, the mode of instruction should de-emphasize the hearing and speaking components. An approach which emphasizes reading, writing, and the cultural aspects of foreign languages and nationalities would be a beneficial contribution to the overall liberal arts educational experience. Secondly, the ability to compensate for reduced hearing sensitivity is not available to these students due to lack of the semantic cues and linguistic experience in the foreign language. The difference in performance in foreign languages by hearing impaired students is not purely auditory, but rather stems from lack of higher level cognitive and semantic aspects.

Table 1. Summary of individual data for all normal hearing subjects

Subject	Age	Foreign Language Experience: Years in High School	Foreign Language Experience: Semesters in College	SRT	Discrimination Scores in Percentages: English	French J1	French J2	French Mean	Spanish J1	Spanish J2	Spanish Mean
1	22	1 (Latin) 2 (French	0	0	98	74	82	78	88	88	88
2	22	1 (French)	0	5	100	84	90	87	94	98	96
3	23	2 (French)	2 (French)	5	100	96	94	95	94	96	95
4	22	3 (French)	2 (French)	10	98	92	94	93	92	98	96
5	22	2 (French)	0	5	100	92	94	93	94	96	95
6	23	2 (Spanish)	0	5	100	92	94	93	94	94	94
7	20	4 (French)	0	5	98	98	98	98	96	96	96
8	26	1 (French)	0	5	100	92	94	93	90	92	91
9	26	1 (French)	4 (French)	10	100	94	98	96	96	98	97
10	23	4 (Spanish)	0	5	98	98	98	98	92	98	95

Note: SRT = speech reception threshold
J1 = judge 1
J2 = judge 2

Table 2. Summary of individual data for all hearing impaired subjects

Subject	Age	Foreign Language Experience: Years in High School	Foreign Language Experience: Semesters in College	PTA: Right Ear	PTA: Left Ear	Aided SRT	Discrimination Scores in Percentages: English	French: J1	French: J2	French: Mean	Spanish: J1	Spanish: J2	Spanish: Mean
1	20	2 (Italian)	0	50	60	25	90	30	38	34	58	66	62
2	24	0	2 (Latin)	53	58	30	84	70	72	71	64	72	68
3	21	0	0	65	67	25	56	34	36	35	20	30	25
4	22	0	0	72	13	25	88	54	62	58	64	70	67
5	22	0	0	70	72	45	80	70	68	69	40	48	44
6	27	2 (French)	3 (Spanish)	48	52	35	96	42	48	45	78	88	83
7	21	2 (Spanish)	1 (Spanish)	58	40	20	98	60	68	64	90	94	92
8	20	0	0	48	58	25	76	42	48	45	32	36	34
9	19	2 (French)	0	52	50	35	72	26	32	29	30	36	33
10	20	0	0	81	95	35	56	18	26	22	24	34	29

Note: PTA = pure tone average
SRT = speech reception threshold
J1 = judge 1
J2 = judge 2

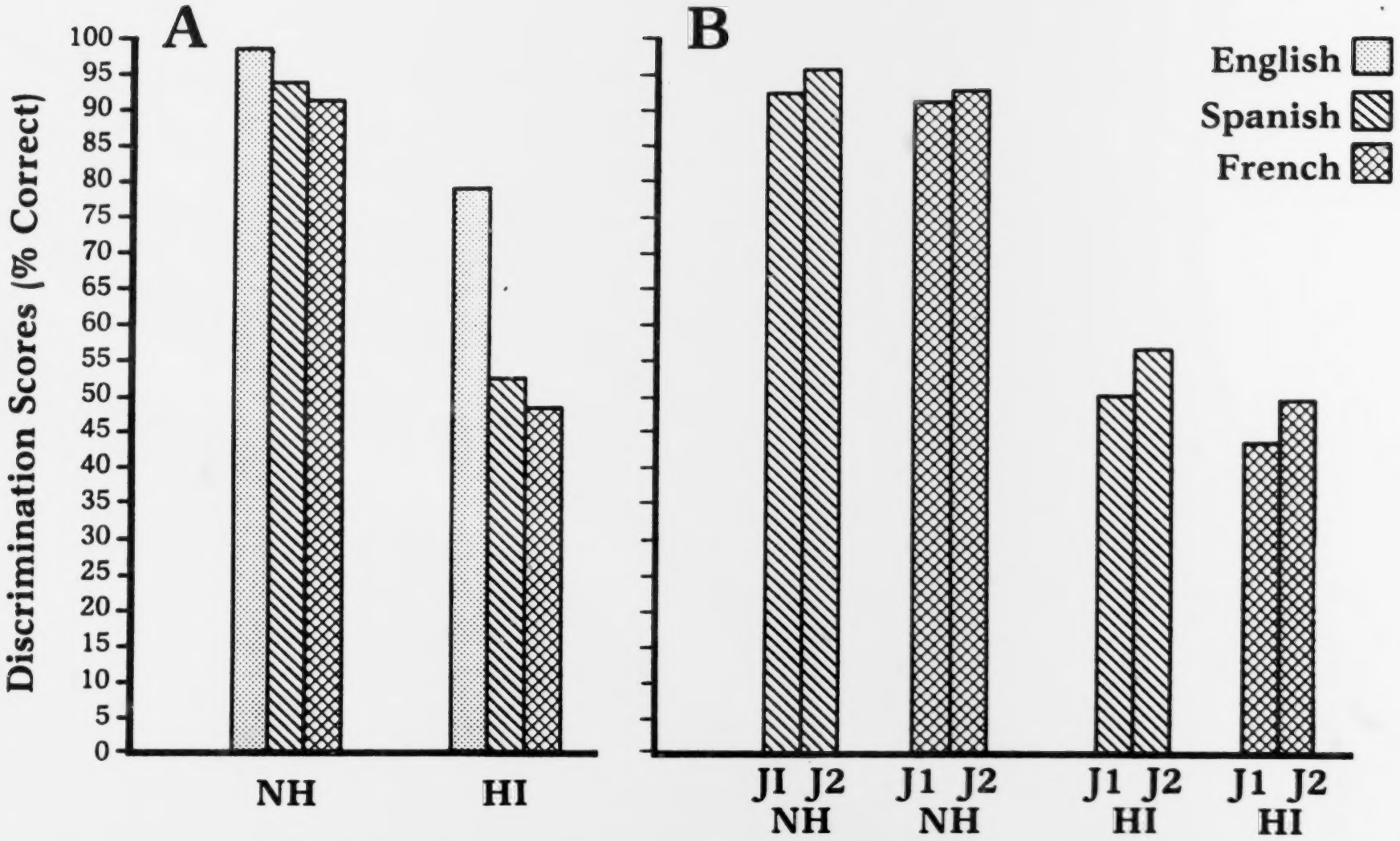

Fig. 1. Means of judge (J1, J2) reliability and discrimination scores in English and foreign languages for normal hearing (NH) and hearing impaired (HI) subjects

Table 3. Mean discrimination scores by language, judge (J1, J2) and group.

	Normal hearing subjects	Hearing impaired subjects
English	99.2 ± 1.03	79.6 ± 14.87
French (J1)	91.1 ± 7.25	44.6 ± 18.28
French (J2)	93.6 ± 4.79	49.8 ± 16.75
Spanish (J1)	93.0 ± 2.54	50.0 ± 24.13
Spanish (J2)	95.4 ± 3.27	57.4 ± 23.63
N	10	10

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